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PAPERS

IN

COLONIES AND TRADE.

The SILVER MEDAL *of the Society, set in a broad Gold Border, was this Session voted to Mr.* CHARLES FREDERICK GRECE, *of Montreal, Lower Canada, for the Culture and Preparation of Hemp in that Province.*

The following Communications were received from him, and Samples of the Hemp and Seed are reserved in the Society's Repository.

DEAR SIR,

I TAKE the liberty to inform you, that I have bought a farm near this city, and sowed this year near twenty-six acres of land with hemp-seed, which Government sent out last year, twenty-one barrels, containing upwards of two bushels each. I had not 2000 plants. In June, the ship Quebec brought some fresh; I obtained twelve barrels of that seed, and sowed it; a drought succeeded, and I lost my crop; but I am collecting seed, the growth of this country, as I find the foreign cannot be depended on. I have sown five acres this autumn, to try what effect the winter will have on it; should it do well, it will be of great advantage to abridge the labour in the spring. Some seed, the growth of this country, did very well, that I sowed in May; but June is too late, unless it is a wet season. I have every reason to believe that the farmers will enter into this cultivation as soon as it is made known, the favours of the Government have not yet been published. I have applied all this year, and at last it is desired to be published for the information of our farmers, but we have not seed for one quarter of the applicants. I am about to erect a machine to break and swingle hemp; should I succeed, I will send a model to the Society. I presume I cannot become a candidate for your premium, the crop having failed. I cannot judge only from one bushel of Canadian seed, which I have kept an account of. I have forwarded a certificate to my brother, the President having complied with the order of Council, and I should be glad of your opinion on that head.

Permit me to subscribe myself, with grateful memory of your kindness when in England,

Your most obedient and very humble servant,

CHARLES FREDERICK GRECE.

Montreal, Lower Canada,
Nov. 3, 1806.

To C. Taylor, M. D. Sec.

SIR,

A BOX of hemp was shipped at Quebec on board the ship Jane, Captain Scott, which cleared at that port on the 3d instant, for London, directed to you, the freight was paid by me. A certificate from his Excellency the Governor-general of the Colonies of North America, according to the directions of the advertisement of the Society of Arts of London, was put on board; a duplicate of the said certificate was put on board his Majesty's ship Amelia, by mistake, the gentleman at Quebec omitted informing me in time of the vessel the box would go by, which obliges me to enclose my report in the present letter, which I hope is such as is required by the Society; and should I merit the honorary reward, I shall be ever thankful for the favour so conferred on me. Should any communication be required on agricultural pursuits from this country, for the information of the Society, I shall always be happy to attend to their requests.

I am, Sir,

Your most obedient and very humble servant,

CHARLES FREDERICK GRECE.

N. B. Captain Patterson, of the Euvetta, New York Coffee-house, will take charge of your commands.

REPORT *of* CHARLES F. GRECE, *of the Isle of Montreal, Lower Canada, to the Society of Arts, &c. London, on the Cultivation and Manufacture of the Produce of one Arpent of Land with Hemp, being Part of thirty-four Arpents, cultivated by him in the Year 1807. The Soil a black Loam, it was an old Meadow.*

		£.	s.	d.
	*Rent of land per annum .	0	6	6
	Ploughed up in the autumn 1806 .	0	10	0
	Cross ploughed in the spring of 1807	0	7	6
	Harrowing . .	0	1	0
June 12.	Sowed broadcast, one minet of seed equal to 36 quarts Winchester measure	0	11	3
	Bush-harrowed the seed in the ground	0	0	6
Sept. 3.	The male stalks were pulled and put into a scaw, in the river St. Lawrence, to rot, when rotted spread on a meadow to dry, and when dry housed .	0	18	10
Oct. 16.	Pulled the female stalks or plants .	1	6	3
	The seed was taken from the plants by a machine, resembling a stool, with two rows of iron teeth, one inch and a half apart, intersecting each other	0	9	2
	Put to rot, when taken out and dryed it was housed . .	0	7	6
	Carried forward	£.4	18	6

N.B. The Protestant planters pay no tithes.

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* The rent of lands here, among the Canadian farmers, is not thought of.

Brought

Brought forward	£.4	18	6
This hemp was dressed by a mill which goes by the assistance of two horses, the expense of breaking, swindling, and heckling . .	2	0	0
	£.6	18	6

Produce of seed was seven minets and a half, at 11*s.* 3*d.* per minet	4	4	4½
Fine hemp, 226 lb. at 47*s.* 9¼*d.* per cwt. . .	4	16	4
Out shot, 45 lb. at 40*l.* per ton	0	16	0
Tow, 20 lb. at do. do. .	0	7	1½
	10	3	10
Expenses brought down	6	18	6
Profit , .	£.3	5	4

From the season for agricultural pursuits being so very short in this country, it would be difficult to plough the land twice in the spring, as such the autumn ploughing being performed, the frosts in winter leave the lands extremely mellow, and it appears once ploughing in the spring answers very well. The drill husbandry for hemp, I presume, would not answer, on account of the plants, having too much room, would become too strong, and produce little rind; I have been convinced that the finer the stalks the more rind is produced. I have sown less seed than usual to the arpent, in order to obtain taller plants. It seems two bushels and a half only produced a linen crop, which is not the object of the people of this province, they want long hemp for the purposes of navigation. I have sown all my land broadcast, after two ploughings, and have had some part harvested with sickles, which is a saving of one pound five shillings per arpent; and it is an advantage in doing away the roots which make the heads of hemp when dressed very unsightly, and I have heard the manufacturers in England complain of them.

Last winter I rotted some hemp in the snow when it first fell, and succeeding snows covered it two feet: in the spring I found it very black and very rotten; as such neither snow or dew rotting will do for foreign markets. I have great hopes that in a few years many people will get into the culture of this article. I have adopted the method to purchase it in its crude state, which is a great encouragement to those who doubted their ability to manufacture.

Last year much land would have been sown, but the seed for that purpose could not be obtained, from the heavy rains which fell and carried away bridges, and broke up the roads in the United States, the way it was coming hither.

I am, Gentlemen,

With the greatest respect,

Your most obedient and humble servant,

CHARLES F. GRECE.

Quebec, 27th July, 1808.

SIR,

We are directed by Mr. Charles Frederick Grece, district of Montreal, to enclose you Governor Craig's certificate respecting hemp; also bill of lading of a box containing 26lbs.

of hemp, and 3lbs. of seed, shipped per the ship Jane, removed from the gentleman to your address.

We are, Sir,

Your most obedient servants,

FRS. and W. HUNTER.

To C. TAYLOR, M. D. SEC.

District of Montreal, Province of Lower Canada. } I hereby certify, at the request of Charles Fredk. Grece, Esq. of Longue Point, I, the underwritten sworn surveyor, on this day, the twentieth of September, one thousand eight hundred and seven, have been on a tract of land, situate at Longue Point, in the county and district of Montreal, in the said province of Lower Canada, the property of the said Charles Grece, where I have taken the dimensions of several parcels of land on the same tract, sworn hemp-seeds, which have amounted in the whole to thirty arpents French measure.

In witness whereof I have delivered the present under my hand and seal.

Montreal, the day and year above.

(Signed)

(L. S.) LOUIS CHARLAND,
Sn. Surv.

I hereby

(L. S.)

I hereby certify, that according to the evidence which was laid before the Executive Council of this Province, in the month of September last, I am satisfied that Mr. Charles Grece did sow thirty-four arpents of land with hemp-seed, in the district of Montreal, as specified in the annexed certificate of Mr. Louis Charland.

J. N. CRAIEFF.

Castle of St. Lewis, Quebec,
7th March, 1808.

By his Excellency's command,
HARMAN WM. RYLAND, SEC.

The THANKS *of the Society were this Session voted to Dr.* ALEXANDER ANDERSON, *Superintendant of the Royal Botanic Garden at St. Vincent, for the following valuable Communication received from him.*

SIR,

I HAVE the pleasure to inform the Society, that the black pepper plant thrives remarkably well in this garden, and has been producing fruit more than a year. Some of its produce I now transmit to you for the Society's inspection. The berries are collected before full maturity. I find it is a plant of more easy cultivation than I conjectured. After it begins to bear there is no intermission. It yields its berries in succession during the year. As soon as one crop comes to maturity the plant recommences flowering.

I have collected a considerable quantity of cloves this season; but having sent last year specimens of them in different states to the Society, it would be superfluous to trouble them with repetitions.

How far custom-house duties on cloves, and the other spices usually procured from the East Indies, and now produced in this island, will admit them as articles of commerce in England, or encourage their cultivation here, I am ignorant.

I am, with great regard,
Dear Sir,
Your much obliged and very humble servant,
ALEXANDER ANDERSON.

Botanic Garden, St. Vincent,
19th June, 1809.

To C. Taylor, M.D. Sec.

The Thanks *of the Society were voted to Mr.* John Maclachlan, *of Calcutta, for the following Communication on the Products of the East Indies. Samples of the Articles are reserved in the Society's Repository.*

SIR,

I had the honour of receiving your letter of the 12th of June last, enclosing the Medal voted to me by the Society of Arts, &c. to whom, if it can be done with propriety, I request you will do me the favour of offering my most respectful compliments.

By permission of the Board of Trade, I take the liberty of sending you a small bag of the silk, or cotton of the Simmel tree of India, with a paper with a few remarks on that curious substance.

A specimen of Salt of very extensive use in India.

Another specimen of Salt, of still more extensive use.

The first is called Lahorie, and the last Bit-Noon, or Kalla-Nimmuk. Two papers of remarks on these salts are enclosed.

For the purposes of medicine these Salts are sometimes clarified, or refined from their earthy impurities; but thinking it would be more satisfactory to have them exhibited in their natural state, they are forwarded so. As there may be still something erroneous in the natural history given me of these Salts, I shall use every endeavour to have it rectified, and if, contrary to what is set forth, they are found to be artificial, I trust I shall be able to discover the process by which they are prepared. Should you, Sir, think any of the articles, with the remarks upon them, worth the attention of the Society of Arts, &c. I beg you will be pleased to offer them with my most humble respects; but, if otherwise, they can be laid aside.

I have the honour to be,

Sir,

Your most obedient humble servant,

JOHN MACLACHLAN.

Calcutta, 17th Jan. 1805.

To C. Taylor, M.D. Sec.

Remarks

Remarks on the Specimens of Salt, No. 1. and 2.

No. 1. The Hindoos of the Upper Provinces call this Lahorie, and the Bengalees Bit-Noon. According to the best accounts I have been able to procure, this Salt is found in the hills of the Punjal, or Five Rivers, and as the name imports, those in the province of Lahorie. Whether it is precisely the Salt which Dr. Henderson, in the 14th Volume of the Philosophical Magazine, describes under the name of Bit-Noben, or Kall-Nimmuk, and which he considers as an artificial Salt, I do not know, although it agrees with his description of it as to taste, smell, and medical qualities. He observes that he was confirmed in the idea of its being artificial, from having seen a mass of it in the form of the earthen vessel in which, he thinks, it was formed; but the accompanying sample, which evidently appears to have its original and natural coat, has no marks whatever of its having been either formed in a mould, or by hand. A solution of this Salt in water emits a strong sulphureous smell, and is of very extensive use as a remedy in almost all internal disorders, whether of man or beast, in this country. Being an article that is brought from a great distance, it is sold in Calcutta at about seven rupees the maund of 82lbs. avoir. and, I think, if it was an artificial production, the natives of Bengal, who are as much alive to their own interest as any people in the world, would long ere now have been acquainted with the preparation, as well as the adulteration of it. I shall use every endeavour to ascertain, beyond the possibility of a doubt, whether this extraordinary article is natural or artificial.

No 2. This specimen is by some called Bit-Noon and Kalla-Nimmuk, and by others Loshun, and is perhaps more generally used by the natives than No. 1. which arises probably from its being cheaper four rupees a maund.—Both specimens, although extremely different in point of texture and appearance, have the same or nearly the same properties. This has much more the appearance of an artificial salt than the other, and is, I apprehend, the kind described by Dr. Henderson, having every appearance of its being prepared by the operation of fire. The following, however, is the account given to me of it by an intelligent physician, at present in Calcutta, but who is a native of Joudpore. He says that this Salt is found in the hills of Joudpore, Oudipore, and Mewar, considerably to the southward and westward of Agra, and is universally believed to be formed by nature. During the period of the hot westerly winds, which is from about the end of March to the middle of June, the trees on those hills, among which he names the Chin-Chin, and Binnu* ignite, from the friction occasioned by their branches rubbing against one another, and produce a fire so intense as to fuse part of both the earth and rock of the hills into the very substance now under description. He thinks it very probable, that the hills contain both rock salt and sulphur; if so, it is probable the specimen, No. 2. is a compound of two alkalies joined with sulphur. This man asserts that it is formed in no other way; but this I shall ascertain more fully.

No. 2. appears to me in its porous texture not unlike the common mineral alkali, kelp, made on some of the British shores.

J. MACLACHLAN.

Calcutta, Jan. 17*th*, 1805.

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* One of the Persian names of the Salt is Nimmuk-Bindi, the Salt of Bindi. Noon, or Noonia, is the Benguly name for salt.

P. S. When the Salts are given internally, either to man or beast, water is given soon after to extricate the gas; they are also sometimes joined with ginger, pepper, long pepper, asafœtida, &c. They are used in disorders of the liver and spleen, of the breast, stomach, lungs, and for pains of all kinds.

The THANKS *of the Society were this Session voted to Dr.* WILLIAM ROXBURGH, *of Calcutta, for the following valuable Communications received from him.*

MY DEAR SIR,

SINCE my last, of the 9th of February, this year, I have got some further matters to communicate. In the first place, this will be accompanied by a sample of the Resin of the large Malabar tree, called by botanists *Valeria indica* *. It appears to me to resemble amber more than copal. It may perhaps be very pure copal, and in this state, like amber when rubbed on paper, as I have this moment tried it, exhibits electric powers, by attracting small bits of paper, feathers, &c. I however do not mean to point out its qualities, but rather send this sample for information, requesting you to get it examined by some well-qualified persons, and let me know the result. Large quantities may be had in this country to send to Europe, if it is found useful, and will answer in price.

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* No. 1564 of my drawings of Indian Plants, sent to the Hon. Court of Directors.

There is brought annually from Muscat in Arabia to this market considerable quantities of a similar Resin, under the Persian name *Kahroba*, which signifies *amber*; some of this I have also the pleasure to send you, and also beg to be informed of its nature and qualities. The purest pieces are susceptible of a fine polish, and are here cut into beads and ornaments, which are much wore by the natives as well as European ladies. I once saw a very beautiful string of these beads sent to England under the name of amber beads. The most beautiful amber-coloured pieces are therefore the most valuable, and are sold for about a shilling the pound by retail in the Bazar. The less pure pieces and the green-coloured are at a much lower rate. My correspondent, who resides where the tree grows in the elevated lands of Malabar, sent me chiefly green pieces, thinking, no doubt, they were the most beautiful, and would therefore be the most acceptable.

In the 9th volume of the Researches of the Asiatic Society at Calcutta is a paper on Olibanum, by Mr. Colebrooke, the president; some of this article, which he was so good as to give me to send to the Society, will accompany this letter; we both wish you would get it examined, and favour us with an account thereof as early as possible, particularly if sending it to London for sale can answer any good purpose. I have not yet got any thing which I think will answer for lignum vitæ, nor have I yet got the log of black wood (Seet. Saul. Hind) mentioned in my last letter. In the same parcel with your three specimens above-mentioned, I have put one of the Resin of *Valeria indica*, and one of Olibanum, for the Company's Museum, which I request you to send with my compliments to Mr. Wilkins, when you can furnish him with an account of their properties.

I remain, my dear Sir,

Your's very truly,

W. ROXBURGH.

Calcutta, April 18, 1808.

To C. Taylor, M.D. Sec.

My dear Sir,

Mr. Amos informs me that more of my Fever Bark is wanted, I mean the Swietenia Febrifuga, (see Coromandel Plants, Vol. I. page 18, tab. 17,) of the properties of which I gave you particulars in March, 1806. I am sorry it is not in my power to send any from hence at present, as I have none by me, and the tree grows amongst mountains many hundred miles from hence. I left some when in England with Mr. Salisbury, at the Botanic-garden, Brompton.

I wish to know the real value in England of the Caducay galls, one of the most useful dyeing drugs known in this country, and of which a particular account is given in a letter of mine, inserted in the 23d volume of the Society's Transactions. If the Mediterranean trade should be obstructed, this article would be of great service in dyeing the manufactures of Great Britain, and particularly in the Turkey red dye upon cotton, as a valuable substitute for the Aleppo galls.

I have at last got the orange dyeing drug, called wassuntaganda, for the Society, and Dr. Bancroft's experiments; it is a powder found on the seed-vessels of my *rottleria tinctoria.* See Coromandel Plants, Vol. II. No. 168.

In a former letter to you, I mentioned, that the gum kuteera was the produce of my *sterculia villosa*, which was a mistake, it is the produce of my *sterculia urens*. See Coromandel Plants, Vol. I. No. 24. I wish this may reach you in time to prevent the error from becoming public.

I have procured a log of the hard black wood *(seet. saul)*, and have shipped it in the Georgina packet, Captain Leigh, to be delivered to Mr. Wilkins, the Hon. Company's Museum-keeper, it is reckoned the largest and most durable wood of this country; but still I fear it will be too soft to be a good substitute for lignum vitæ.

The wassuntagunda I have also sent under cover to Mr. Wilkins; he will no doubt send it to you.

You will receive from me soon a corrected copy of all my former experiments on indigo, with explanatory drawings. On my departure from England, I left with you some papers on various subjects, they may contain some matters deserving notice, when you have leisure to arrange them, as I left them in a rough, unconnected state, having not had time to put them in order.

I mentioned it to you in England, that I had frequently sent the seeds of vegetables from the East Indies to London, enveloped in thick mucilage of gum arabic, which was then suffered to dry with the seeds incorporated therewith; in this mode the vegetative power of the seeds is well preserved, it being necessary only when they are to be sown that the mixture of gum and seeds should be put into water, which will redissolve the mucilage, and leave the seeds in a state ready to be put in the earth.

In consequence of the difficulty which subsists in the carriage of plants from England to the East Indies, I have enclosed some directions for preventing the accidents which have hitherto occasioned great losses in their conveyance.

I am, my dear Sir,
Your's very sincerely,
W. ROXBURGH.

Received without Date from Calcutta, May 18, 1809.

To C. Taylor, M. D. Sec.

Directions for taking care of growing Plants at Sea.

Particular care, if not placed in a cabin, must be taken that they are kept covered during stormy weather, or such as raises the least saline spray into the air, for the chief danger plants are liable to at sea is occasioned by the saline particles with which the air is then charged, these falling on the plants, quickly evaporate, but leave the deadly salt behind; every care must therefore be taken to guard against salt water and the spray at sea. During moderate weather, it will be proper to keep the boxes open, for plants cannot long exist without air and light, also during moderate rain, which is much better for plants than water from the cask, but too much moisture is more dangerous than drought. When the weather is dry, it will be necessary to give them a little fresh water now and then, the periods and quantity cannot be pointed out in any instructions, as the state of the weather must be the guide.

Directions where to place the chests cannot well be given, as that will in a great measure depend on the size, structure, &c. of the ship. In our Indiamen, round the capstan on the quarter-deck seems the best on many accounts, the greatest danger in such a situation is while the deck is washing in the mornings, the boxes must then be shut, and covered with a piece of canvas, or something to prevent the salt water getting in between crevices.

When plants from a cold climate get into a warm one, they shoot most luxuriantly, and often kill or choke one another; the longer shoots must therefore be frequently shortened, and as many of the leaves thinned as will give the rest air and room. Insects, particularly caterpillars, often make their appearance about the same time, they must be carefully picked off.

Baskets with roots, (such as potatoes, &c.) or succulent plants, may be hung up in any cool, airy place, such, for example, as the projecting part of the deck which covers the wheel in our Indiamen, or hung over the stern, but in that case they must be covered with a tarpaulin or painted canvas.

Seeds ought to be kept in a cool, dry place, and never put below in the gun-room, hold, or lower deck.

Roots ought to be packed in dry sand, after being moderately dried, and dispatched in any ship that sails about the close of the year.

The following Communication from Dr. B. HEYNE, *on the Soda, or Mineral Alkali, prepared in the East Indies, was presented to the Society by Dr.* WILLIAM ROXBURGH, *of Calcutta.*

Remarks on the Soda prepared from an Earth, common on the Coast of Coromandel, by Dr. B. Heyne.

SODA is a salt, known in Europe under the names of Natron Mineral Alkali, Soda, Barilla, Kelp, &c.

In the southern parts of Europe *, particularly in Spain and in the northern districts of Africa, it is made by the incineration of different plants, and called soda †, and barilla ‡, &c. In Scotland and Normandy, it is produced in the same way, but in small quantities and of inferior quality, and named kelp §, and soude varech.

On the island of Teneriffe, soda is found in some soil naturally, and also in Persia, China, Siberia, and many eastern countries.

All these different species are in fact but mixtures of various salts, among which soda is either the most abundant or the most valuable ingredient. Many of them, prrticularly kelp, contain but a small proportion of it, enough, however, to render them useful in different manufactures.

The most copious salt of that composition is muriate soda, commonly called sea-salt; many chemists have considered it even as the primitive substance from which soda is formed by decomposition. Whether it is so or not, I cannot decide; but it is known that ground liable to be inundated by the sea, and plants used for the preparation of barilla and kelp, growing in salt water, produce nothing but common salt, without any remarkable admixture of soda.

Near Tripoli ‖ it is found, free from sea-salt, on the surface of some grounds; the only place, to my knowledge, hitherto known in which it is had in this state of purity.

In British India, soda has been discovered in some abund-

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* Vide Macquer's Chemical Dictionary, Vol. VI. p. 149, &c.

† Vide Boehmer's Technical History of Plants, (Tictmische Geschichte der Pflanzen,) Vol. I.

‡ Vide Boehmer, l. g. Vol. I.

§ Anderson's Account of the Hebrides, p. 148.

‖ Vide Wiegleb's Chemistry, p. 193, note.

ance, and has been used by the natives since time immemorial, and might be gained in such increased quantities as to supply all the demands of England.

On this peninsula it is found both inland and along the coast, but never, if I recollect right, very near the sea, or on spots washed by it. It might be rather said that it is produced on places that, for some part of the year, are swamped with fresh water; a circumstance very remarkable is, that it is obtained often without any admixture of muriates, though it is not quite free of other salts.

It admits particularly sulphuric salts in its composition, and I was in sanguine hopes of discovering borax in it, but the experiments I instituted on this account did not answer my expectations.

Its presence in a soil is indicated (if it contains sea-salt) by the mouldy and crumbling black appearance and moistness of its surface in the morning, and, where free of that salt, by the same signs, with the exception of moisture.

The washermen, and in Mysore the tank-diggers, collect it, by sweeping the places on which it is discovered. The former use it to make a ley, with which they wash and bleach, and the latter (as the natural salt-factors* of the country) extract its salt, and sell it in the Bazar, in the rainy season, to the washermen and glass-manufacturers.

This earth, commonly called Washermen's Earth, by the English, is denominated Soudoo in Telinga, and Wadamannoo in Malabar; and the salt prepared from it Soudoo-billa and Wadamannoo-billa.

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* They are called tank-diggers by the English, because they are employed in the construction of all kind of mud-work. Most of them are Telingas, and a very handsome and hard-working race of people. They call themselves Uppara Wanloo, or, literally translated, salt people.

The places from which it is brought for sale to Bengalore are Kishnagherry and *Madoor*; at the former it is perfectly free of sea salt, but I do not know how it is at the latter. At Matod, near Chittledroog, it is also collected in great abundance, but solely for the manufacturing of glass; and the glass gall, which is formed during the process on the mass on glass, shows that sea-salt is contained in some abundance in the soude of that place.

In smaller quantities it may be had at many places, particularly in a state in which the common salt is abounding. In this case the latter is separated (in Mysore) from it by crystallization, and considered as the most valuable part of the mixture. It is used by the poorer classes of inhabitants, who cannot afford to buy the dearer sea or bay salt, though it is said to produce eruptions on the skin; and in some places it is used by all descriptions and ranks of people.

By a slight examination I found that it effervesces with nitrous acid, and imparts a bluish red colour to Brazil paper, indicating that it contains an alkali or earth. The colour of turmeric paper is not much changed in solutions of that salt in hot water, nor does the muriate of ammonia (sal ammoniac) mixed with it, cause a smell of volatile alkali; so that I should rather take it to contain an unsaturated muriate of lime in a small quantity, or a carbonate of lime, which it might have acquired in the vessels or beds in which it has been evaporated.

The nature and appearance of the places which produce either the one or the other deserves yet to be ascertained, as a perfect knowledge of it would throw great light on the nature of the bases of these substances.

The earth containing this salt is collected only in the driest months of the year, viz. from January to May.

The soudoo[*] from Kistnagherry, in the Barramaul, when dry is of a greyish colour, feels sandy, and has a strong saline taste in which the common salt seems to prevail. It has also a kind of smell which might be called alkaline. With mineral and acetic acids it effervesces. It stains turmeric paper brown, and Brazil paper bluish red, disengages the smell of volatile alkali, when mixed with ammoniac, and does not attract the moisture of the atmosphere. Thrown on charcoal it does not crackle. It contains in 12 ounces, according to my experiments, about $1\frac{3}{4}$ ounces of salt, and probably on an average $\frac{1}{10}$ of marketable Soudoo billa.

The natives make these billas by pouring water on the salt earth contained in conical vessels, which are open at their inverted apex, and evaporate the obtained ley in the shallow vessels or beds by the mere heat of the sun. The saline product is naturally found (mixed with many impurities) in the form of a thin cake of the size of the bed, which is broken, and is commonly about a quarter of an inch in thickness.

These pieces of the billa have all the properties that have been described of the earth, only in a stronger degree, and are therefore better adapted for the following experiments.

Alkohol renders the solution of the Billa turbid, and precipitates almost immediately acicular crystals, which, at their bases, are united and shoot but obliquely, so as to form a cone. From two drachms of it I obtained about ten grains of crystals. They effervesce with all acids, stain turmeric paper brown, have an alkaline taste, and melt easily before the blowpipe, in the beginning with some effervescence, but when redissolved muriate of barytes shews by its precipate that they contain sulphuric acid. They are probably soda not quite saturated with sulphuric acid.

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[*] Soudoo means properly earth containing salt of any kind.

The presence of the sulphuric acid is farther proved by boiling the solution of the billa in water, by the slow evaporation of which, large and beautiful crystals of sulphate of soda are gained, or what was called formerly Glauber's Salt.

I need scarcely say, after what has been observed, that the muriate of Barytes produced also in the solution of the billa a copious white sediment, and that nitrate of quicksilver caused a turbidness, and afterwards a straw-yellow sediment indicating a *sulphate* of quicksilver.

Marine acid, as much as I suspected it, could not be sufficiently proved; nitrate of silver, which I employed to discover it, yields a precipitate, flocky and white in the beginning; but this I saw on reflection might also be produced by the soda and sulphuric salts; by crystallization I could not obtain a single crystal of muriate of soda.

It would be superfluous to prove by more experiments that a free alkali is contained in this product, but that it is soda (mineral alkali) and not kali (vegetable alkali) we may be convinced by attending to the different neutral salts which it constitutes with the sulphuric and other acids, and by the fact we know that carbonated kali diliquesces, and carbonated soda, as ours, keeps dry in the open air.

Lime, which I suppose to exist in considerable quantity in that aggregate of salts, I could find only in a small proportion by saccharine acid dropped into a boiled solution of it.

The carbonic acid united with it, is evinced by the effervescence that takes place on the addition of mineral acids, and by the white precipitate produced in its solution by lime-water.

In order to find the nearest proportionable quantity of the principal ingredients in the mixture of the Soudoo billa, I made a number of experiments, which, as they are rather defective, I will not relate circumstantially; but, by the results I am about to mention, a chemist will find that as much attention has been bestowed on them as circumstances would allow.

The Soudoo billa contains, according to many trials, about one of matter not soluble in water, as sand, straw, &c. The rest of it, namely, nine, consists of salts, and chiefly, I believe, of soda.

In order to find the probable quantity of soda in the mass, I neutralized the solution with sulphuric acid, and used particularly that contained in common alum, as its quantity is pretty nearly ascertained.

To saturate 1 ounce of Soudoo billa in rain water were required 2 drachms 40 grains of alum, which, on addition, produced a plentiful sediment of a glutinous or butyraceous substance, that, well washed and dried in the air, weighed 110 grains. It had, whilst moist, a very astringent taste, and did not seem to be soluble in alcohol, though it was apparently acted upon by that liquid when diluted with much hot water;—nitrate of silver produced a white, flocky precipitate, and dried it had an earthy taste. To judge from appearance, it might have been a muriate of alumine not perfectly saturated, or a borate of alumine; but it did not melt before the blowpipe into the glass, which the latter salt would have done, nor did it show any other signs which could entitle it to the former name.

Exposed to heat, this substance lost 55 grains, which had an earthy taste and appearance, and was probably nothing but the earth of alum.

From the strained solution I procured about 6 drachms of sulphate of soda, (Glauber salts,) in fine crystals, which, after losing its water of crystallization, weighed about 190 grains, and consequently more than it should do, according to common acceptation.

According to the last-mentioned result, we may suppose near 116 grains[*] of pure soda to be in 1 ounce of Soudoo billa, which, carbonated[†] and crystallized, would amount to more than double that quantity, or one half in the whole mass; of which only 25 grains are to be deducted for the soda in the sulphate.

By other experiments, in which I saturated the soda with sulphuric acid, I received the same quantity, and by sulphate of magnesia I gained sulphate of soda in a much greater proportion.

From half an ounce of soda billa, dissolved in rain water, I procured near one drachm of sulphate of soda, in fine large crystals, and the rest consisted of uniform small acicular crystals, which I took for pure carbonated soda.

The proportionable quantity of soudoo billa, or Indian soda, may be estimated therefore to be $\frac{1}{8}$ of insoluble matter, as earth, &c., $\frac{5}{8}$ of soda, or carbonated mineral alkali, and $\frac{2}{8}$ of sulphate of soda (Glauber salts).

These proportions, however, are merely intended for the merchant, or as a guide to the manufacturer; for a chemist will find they are not the result of nice experiments.

It has been already observed, that the washermen of this country prepare from this earth, or the salt of it, a ley, with which they wash and bleach cotton clothes, in a way superior to what can be done in other countries.

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[*] Wiegleb, in his Chemistry, p. 207, says, that 68 of alkali require 52 of sulphuric acid for saturation, and that Glauber salt has half of its weight of water of crystallization. There should be contained therein 6 drachms of our salt, 115 grains of soda, and 817 of acid.

[†] In Wiegleb's Chemistry 6,193 is stated, that mineral alkali admits more water in its crystals than any other salt, one pound containing from 10 to 12 ounces, and page 208; that 100 parts of mineral alkali, urged with a red heat, loses 32 parts of aërial acid.

This I am sure cannot be ascribed to their skill, for what with carrying the palanqueens, and doing other menial services in the houses of the rich, they are a most stupid race of mortals. Their success, therefore, must be solely ascribed to the use of that substance.

Many learned in Europe have long ago recommended soda in preference to the more acrid potash, for the purpose of bleaching and washing, and probably nothing but the scarcity or high price of this article has prevented its general use. Should this obstacle be removed by the importation of soda, the advantage accruing from it will be soon universal.

In the making of glass it is in some parts of the country scarcely less important, as most of the Indian ladies adorn their arms and feet with the bangles made of its product, not in the most sumptuous, but, in their ideas, the most bewitching manner.

It remains now to be determined, whether *soda* would fit the European market in the state in which it is sold in the Bazar, and if it be sufficiently cheap to bear all expenses of merchandize.

Both requisites would be best ascertained by sending a sufficient large quantity to England, enough at least for some trials; to judge by mere theoretical principles and knowledge, it must answer both for the glass-houses and for the manufacturing of soap.

I imagine it will be found superior to kelp, as much so at least as the salt proved which Lorgna * obtained by elixivation of a great quantity of earth at Ritratte di Chioggia.

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* He received but one pound from 150lb. of earth. Macquer's Dict. Vol. I. p. 151.

The small degree of hardness which the soudoo billa possesses, cannot be, in my idea, an objection to it, and may be, probably, a recommendation: but if, for the sake of conveyance, it should be required to be made harder, it could very easily be effected. Means may be also found to separate the sulphate of soda from it, if it should be found injurious.

The price of it deserves to be remarked, and the lowest at which it might be procured is to be ascertained; at present it sells in the Bazar at Bengalore, per maund (27lb. 6 ounces) at 2¾ gold fanams of 11 Madras fanams; a cwt. of course will rate about eight shillings.

At Royacotah and Kestnagherry it may be had now at 1½ gold fanam (or 6 little fanams) per maund, which is nearly 100 per cent. cheaper than here; and I have no doubt but that, in course of time, it may be delivered at Madras, or another sea-port, at 4 fanams per maund, or for less than two shillings the cwt.

B. HEYNE.

To Dr. W. Roxburgh, Calcutta.

The following Communication of Dr. B. Heyne's *Excursion to the Diamond Mines at Mallavilly, in the East Indies, was presented to the Society by Dr.* William Roxburgh, *of Calcutta.*

Report *of an Excursion to the Diamond Mines at Mallavilly, by Dr.* B. Heyne.

Diamond mines, and the ideas they convey, should, I think, induce persons, even the most indifferent about mineralogical pursuits, to devote some part of their time, however precious, to view those recesses in which Nature has performed one of her greatest mysteries. Many gentlemen who have resided at Ellore, or at other places in the vicinity of mines of that kind, I am sure have for that and other reasons visited them often, so that I now feel myself quite at a loss how to account for their silence on so interesting and curious a subject, and for their leaving to me the task of laying that before the world, which many of them, it may be believed, certainly were more adequate to in every respect. If it was too great a share of modesty, or diffidence, that deprived the world of their observations, I beg leave to assure them, that neither self-love, nor an improper degree of confidence, directs me in publishing my reports. It is better a thing should be half known than not at all; the former may lead to a perfect knowledge of the whole, and, on this particular subject, may animate others who are better informed, to rectify my errors or supply my deficiencies. It is with this view I have ventured to step forward.

Eight coss W. S. W. from Ellore is a village, called Mallavilly, belonging to the Nizam, and another two coss from it, where diamonds in former times, I was told, had been found. Depending solely upon this, I determined to visit these villages, flattering myself with nothing more than to find an old man in one of them, from whom some information might be collected. It was in the night of the 25th of May, 1795, when I set out from Ellore, and at day-break I found myself in that village, close to the hills, and on all sides surrounded with jungle. In expectations of discovering some singularity on the ground about me, I cast my eyes upon it the very moment my palanqueen stopped, but found that it was of a kind very common, viz. red sand and gravel. Upon enquiring after the former diamond mines, I was desired to wait a little time, if I pleased, and go along with the miners to those places which they were working. How satisfactory and pleasing this answer must have been to me, who had made a tour of almost one hundred miles, expecting to see nothing more than the remainder of former luckier times, will only be imagined by an amateur of a science who once had been agreeably surprised in the same manner. My impatience to view those remarkable places did not give me rest; I engaged, therefore, a little boy to show me the road to them, before I perceived the labourers collecting, by whom, however, I found myself soon overtaken.

Whether it was from apprehensions they came earlier than usual, or if it was the proper time to commence working, I cannot pretend to say; men, women, and children, made a group altogether of perhaps forty in number. They behaved very civilly, and entertained me, during our progress, with pointing out the fortune that might be made in a very short time by investing some thousand pagodas in working these mines. From them I heard also that it is at the Nizam's own hazard that these mines have been worked for many years past; though every body is allowed to try his fortune, provided he takes a permit from the Muzmadar and Despondiahs of the district, to whom he has to pay monthly half a rupee, and as much to the Nizam's tannadar, for every man who is employed in working the mines. Nothing is paid to the Nizam himself for the license, but he reserves a claim to all diamonds exceeding the weight of a pagoda, which is 12-13 carat; but these they meet with so seldom, that he and other Indian sovereigns do not certainly reserve the privilege, in order that the price of that article may not fall. The Nizam, I understand, enjoys that prerogative every where in the Circars where diamonds are or might be found. We conversed on such subjects till our arrival at the mine. It lies half a mile to the westward from the village, and nearer to it than any of the older, all of which are concentrated in a kind of semicircular bason formed by hills, which encompass it from the north, west, and south, and on the opening of which to the east is situated the village of Mallavilly. The transversal section of the semicircle here, may be computed to be about one mile and a half. I did not stay long enough to ascertain what kind of stones those hills exhibited, but, according to what is commonly found in this part of the globe, they mostly consist of rocks of a coarse kind of granite, of a recent or secondary formation.

The stones which lie dispersed in the village, roads, and fields, are in a greater quantity than in other villages thereabout, and are probably dug up from the mines, and scattered about by accident. They are quite of the same kind as those found in the mines, of which I shall explain hereafter. I could not observe any particularity taking place in the products of the vegetable kingdom. The jungle thereabout consisted of shrubs that may be found in all those of a sandy soil in the northern Circars, which I will here not expatiate upon, as I may venture to do it at another time, when more acquainted with the many objects occurring in this kingdom.

The mines, if I may call them so, are large cavities, various in their breadth, but in general from 15 to 20 feet broad, and from 25 to 30 deep, all the sides being like walls cut perpendicular and smooth. The people, from the age of twelve years, and of both sexes, are working here, and are allowed three seers of Joonaloo every day for each man, besides one and a half rupee per month. The men dig the ground with long iron crows, and the women and children carry baskets upon their heads of the several strata of earth to the places allotted for each sort, which gives those works at a distance the appearance of small fortifications.

The earth of the stratum in which the diamonds are found they keep in a place environed with stone half way up, reckoned from the bottom of the mines to the surface of the little hillocks thrown up, from whence they carry it to another, in common the highest and lightest place, when they have enough to commence washing and scrutinizing it. At these places one or two of the Nizam's peons are constantly attending.

To lay out money in this kind of pursuit seems to be a very precarious thing; many have lost, and others would have experienced the same, if they had not the means to go on till they were reimbursed, and then they wisely stopped.

The Nizam is said not to have met with any loss of late, and that especially last year he had been very lucky, for several diamonds were found which were valued at 2000 pagodas each. . He certainly deserved it, were it only for the good he did during the late famine, when he not only did not give up this business, (expensive and losing as the concern then was,) but rather increased the number of labourers. This account, however, I have from none but the labourers, who find it, very likely, advisable to extol the bounty of their sovereign rather than to speak truth.

This and many other interesting though trivial circumstances are spoken of with much more precision in common conversation than I find myself able to describe here. I shall now venture on a subject, which by many travellers has been overlooked, and in general scarcely as yet has been attended to, and which alone caused my resolution of going there, namely, to see the several stratas of earth, which cover the diamond beds, and the latter itself.

For instruction on that head, and especially to form some judgment by comparing those at Mallavilly with others, I consulted in vain the writings of learned travellers. Entertaining and curious accounts of the value of diamonds at those places, &c. were all I could collect from them. In fact, many of them speak as if they never had never been there, and had entirely depended on the information received from the natives, who, we know in order to please, and flatter the judgment of the querists, will model their answers accordingly.

If proper notice had been taken of this, the learned would be advanced probably a little farther in the knowledge of the mode which nature uses in this operation, namely, the formation of the diamonds. My opinions on the subject, I shall perhaps venture at another time to lay before my learned judges, who will no doubt treat me kindly, even if I should be in the wrong, which I fear is likely to be the case, having to rely solely upon my own solitary observations.

Mr. Thomas Motte, who has made a journey to the diamond mines at Sum Chulpoor in the year 1766, a narative of which has been given in the Asiatic Miscellany, says little or nothing on that subject, and that little I beg leave to transcribe here literally, as extracting from it might do injustice to his otherwise very entertaining and instructing writing.

Volume the second, page 58, of the Asiatic Miscellany, he says, "The next morning, having marched three miles, we passed the side of a rock, which projected into the great river, and come to the mouth of the river Hebe, where the diamonds are found. A servant of the Rajah, who had charge of this rich spot, met us with only three attendants. A countenance naturally morose, a voice studiously rough, and sentences affectedly short, with a desire of looking formidable, joined to form one of the most disagreeable human creatures I ever saw. Raby was so much out of humour with him, as to propose to me to beat him into good manners; but this brute expressed much surprise at the curiosity which brought me hither, and, after I had worked him into good humour by a present of two yards of scarlet broad cloth, became more communicative. He told me it was his business to search in the river Hebe, after the rains, for red earth washed down from the mountains, in which earth diamonds were always found. I asked him if it would not be better to go on the mountains and dig for that earth. He answered it had been done, until the Marhattas extorted a tribute from the country, and to do so now, would only increase that tribute. He shewed me several heaps of the red earth, some pieces the size of small pebbles, and so on, till it resembles coarse brick dust, which had been washed, and the diamonds taken out. I was desirous of going towards the source of the river, but my guide told me it was impracticable during the rainy season. Where the river Hebe discharges itself into the Maha Nudee, it is 200 yards wide. I went into it in a boat, and found a bay, near a mile in diameter, the banks of which were overshadowed by thick underwood. I with great labour got the boat forward two miles, to where the river poured from the mountains, then convinced that what my guide had told me was true, I returned not a little dissatisfied."

Of the famous traveller, Tavernier, we hear, (according to Magellan, in Cronsted's Mineralogy, Vol. I. page 123,) only that diamonds are found in a sandy earth, and the loose earth that fills the clifts of some rocks. That the mines at Coulour are in a marshy ground, and that those of Soumelpour are found in the bed of the river Goul, &c. and Mr. Bomare says that they are sometimes found stuck to rocks, and in clusters like rock crystals.

How much or little this agrees with my observation on Mallavilly, the reader will easily determine by comparing it with the following.

The first stratum, as above observed, is composed of a red sandy gravel, and a little clay. Its thickness in common does not exceed above one or one and a half foot. It has been formed probably by the wasting of the granit and other stones, of which the nearest hills seems to consist, which must yield, as every thing existing does, to the common destroyer time.

The heavy rains by which they are constantly destroyed is able also to remove them in this reduced state to a lower place. The sand is carried down by the same agent, and thus found, in length of time, undisturbed by the plough. The next stratum consists of a black, loamy earth, with a mixture of a little gravel, which, if I may be allowed to conjecture, was formed at a period when the natives were mere cultivators, and unacquainted with the treasures that were hid in the bowels of the ground. This I am led to believe, on account of the scarcity of large stones in this stratum. It is three feet thick, and more in some places.

The third stratum succeeding the former, and almost of the same thickness, is widely different in its composition. It is a clayish earth, loosely mixed together, and half indurated calcarious earth, both in small lumps. In point of quantity the former is the prevailing. This covers the fourth and thickest stratum of all, with which it agrees in its ingredients, composed also of clay and chalk, but in various places in different proportions. Its component parts are more intimately mixed than that of the former, and it partakes more of the chalk. The miners divide it into three different stratums, attending by doing this chiefly to the colour, which however appeared to me so insignificant in its variation, as to be unworthy of any particular notice. Had I understood their language better, I might perhaps have found even their assertions on this subject of more importance. From the middle of this stratum downwards I observed many dispersed stones of a rounded form, from half to one foot in diameter, and some of them incrusted with an ochrous matter. I cannot venture a conjecture on the mode in which this stratum, and the others in which calcarious earth is a component part, might have been produced, as it is still very dubious if this kind of earth be the primitive, or one produced by animal destruction. In this particular instance it may be depended upon that no traces, either of shells, or of any other sea products, are discoverable, which might serve to confirm the favourite idea of some of the learned.

At many other places in this part of the country calcarious earth may be found in abundance at a certain depth, and always, as I have observed, without the least sign that could give sufficient reason to trace its origin from a deluvian period. It deserves, however, on this and other accounts, to be ascertained if those strata of calcarious composition continue their course under those huge masses of granite and silicious stones which constitute the hills of these countries, and which indeed may be supposed, as they are near and almost at the foot of them. If this should be the case, it would incontrovertibly evince the seniority of the calcarious earth to that of others.

The hills of the northern circars exhibit many specimens of very fine calcarious stones, and farther to the northward, I am informed hills are found consisting entirely of a kind of marble. The Apragum and Kistnaprogum of the Gentoos and Tamuls, that likewise are collected in some places amongst the hills, regularly and irregularly crystallized, in common semitrans parent, are nothing but a gypseous spar; burnt like lime-stone, it falls to a very fine powder that does not effervesce with acids, &c. It is administered by the natives in all kinds of gonorrhœas, or in disorders to which the dissolute part of them are too frequently exposed. Another sort of stone very common on the hills, and forming often veins setting through the main rock of granite, is, if I may call it so, a micaceous spar. It is harsh and dry, with a smooth yellowish-white shining surface and fracture, breaks often in large squares with sharp angles. When beaten with a hammer it is found to consist of horizontal transparent lamellas or scales of micaceous appearance. Coloured mica, and especially black, I have found in pretty large pieces.

Want of instruments, especially an earth-borer, has prevented me scrutinizing the different strata about Samulcotah. At some places, where deep holes had been made into the ground, I found thick layers of indurated clay impregnated with ochre. Few other enquiries would be attended with more material consequence to the country and its masters than such as tend to acquire a knowledge of the different kinds of earth and strata in their possessions.

It would lead by analogous conclusions to many discoveries in mineralogy, which, if advantageous, must be highly satisfactory to every friend of man, on account of the universal benefit which may be derived from them, for unfortunately many other discoveries are in the same degree detrimental to the subjects as they are beneficial to the superiors.

For this digression, I must beg the reader's pardon. It seems at all events, for many reasons, not to belong to the subject, or it might have been retained with convenience till the next stratum had been treated of; but then I thought many other objects would offer themselves to our imagination, from which the mind ought not to be seduced by less interesting ones.

The next stratum is that in which the diamonds are found.

It is nearly of the same composition as the former, with the difference only of containing a greater proportion of yellow clay. The ingredients are nearly in the following proportion to each other. This, however, cannot be depended upon, as its accuracy was the result of one experiment only, which I was prevented repeating by the small quantity of the specimen I was able to carry off from the mines, the greatest part of which I wished to preserve for more experienced and learned inspection. I would have gladly seized a greater quantity, and paid for it, if the first could have been done with propriety, and the latter with the consent and without exposing the overseers to a great risk.

This stratum is from three to four feet thick, and constantly moist, owing to the water which lodges in it, which probably is accessary, or highly requisite to the formation, let us call it to the crystallization, of the precious gems; much water is collected at the bottom of the mines.

A great number of small rounded stones enter the mixture of the other ingredients of this stratum. These, the miners call the mother (matrix) of the diamonds, on account of their having observed the diamonds in general attached to them. These stones are not discoverable in any other strata, and, as above described, larger stones are not to be met with here. They are, however, what might have been expected, not of one kind or form, some being little else than an indurated lamellated ochrous clay; others a bole of the finest sort, others again a compound of silicious particles and ochre, which seem to be cemented together with clay. In one of the latter sort I found some micaceous particles that had quite the appearance of gold leaf.

The subject itself leads now to nothing more naturally than to the question, Which of these several kinds of earth is the proper matrix of the diamonds? All, except the ochre, and even this, though not in so great a quantity, seems to exist in all other stratas. My opinion is, that the calcarious part of the stratum, and the phosphorescent particles of the iron are the two most essential things that Nature employs for the formation of one of her hardest substances. Comus already supposed, some time ago, that this gem was chiefly composed of calcarious earth, and the phosphorescent principle. What determined him to reason thus, I cannot pretend to say, though I cannot help thinking my observation gives a great support to his opinion. The decision of this depends now entirely upon analysis of the diamond itself, which, on account of the preciousness of the gem, and my inexperience in instituting such nice experiments, I cannot venture upon in my present situation.

Bergman, in his Dissertations on the Earth of Gems, says of the diamond, " The precipitates show that there is present an earth soluble in acids, the nature of which remains to be discovered by employing a larger quantity. The deflagration, the soot, and the black pellicles, show the presence of an inflammable matter."

At other places, speaking of gems in general, he looks upon it as undeniable, that they belong, in a system of natural history, to the tribe of compound argillaceous substances, but admits of calcarious earth entering their composition.

Thus much he says in general, but does not venture a farther conjecture, on account of not having been able to subject it to a complete course of experiments.

Other chemical authors give as long and interesting accounts of the experiments insituted by several of the learned on the inflammability or deflagration of this gem, and the results; but they never enter into disquisitions about its composition, and, if they do, it is but very superficially.

There being apparently very little or no difference discoverable in the component parts of the two latter stratas, another question arises, viz. What reason may be alleged for their sterility? The want of water, I conceive, and with some degree of probability. The diamond partakes, as is universally known, of the property of many other mineral substances, it being found in general in a regular form viii. and xii. angular.

Solution precedes always crystallization; and water, it should appear, can be the only fluid that here is the solvent; of any other, we find at least no traces.

Another cause may be induced, the greater age of the under stratum, which especially, if the assertion of the miners may be believed, seems to be not quite so groundless. They advance, that diamonds, though of a very inferior sort, might be found in the under part of the upper stratum.

Future, but very remote periods, therefore, must determine whether diamonds require time to come to perfection, which, if it should be the case, would even agree with the rules of crystallization, as it may be proved that too great a want of water does not admit of a perfect solution of the respective ingredients of that gem.

For the reasons stated above, I cannot but dissent from the opinion advanced by some gentlemen, who believe that this gem has been formed by the interference of fire, though even the latter, it cannot be denied, could be a menstruum adapted for producing crystallization in some substances. In the above-quoted narrative, the author is of the latter opinion, and reasons in the following manner:

" The great Boyle advances, that the generality of transparent gems have been once liquid substances, shot into the form of crystals, by the supervenience, or the exalted action, of some already-existent pretrescent liquor, or petrific spirit, which he supposes may sometimes ascend in the form of steam. This hypothesis is supported by the doubt of Jeneherus of the diamond's hardness, by an ingenious French author, who reduces it to a phosphorus, and by some noble experimentalists, who think they have caused it to evaporate. Tavernier and others say, that the matrix in which it is formed is a cavity in a flint; but as I had samples of the strata in which it was found, both here and from Bundelchaud, and observed it was a clay which appeared burnt red, nearly to the degree bricks usually are, I think the diamond was formed not without the interference of fire, perhaps of a volcano, but that a greater degree of heat than that which was necessary to the formation of it may affect the petrescent liquor, or petrific spirit. This is a subject on which I have made some experiments, read much, and thought not a little. I may hereafter find time to collect my inferences."

The experiments on the deflagration of the diamond, should, I think, not give room to any such idea as this author and others have advanced, as it is proved,by unexceptionable authority, that this gem in open fire may be volatalized, and even when placed in balls of porcelain clay, or crucibles of that substance, according to Arcet's observation. If exposed to a fire, even not the most violent, it burns with a brilliant flame, forming a gloria about the stone, and is, in fact, consumed almost in the same manner as other combustibles.

It does not, therefore, appear very credible that the same should create the existence which causes most evidently the destruction of one and the same thing. The heat of volcanoes certainly exceeds in all its stages that of our furnaces, in which the diamond may be destroyed. The air seems not to be excluded by any impediment: how difficult, therefore, would it not be to prove their generation in that work-place, which, in the moment it produces, must certainly annihilate them again.

In order to oppose that hypothesis, I may further advance, that, (as far as my mineralogy goes,) in all the countries where diamonds are found, volcanoes, or even the traces of them, are not to be met with; and, on the contrary, that in other tracts of land produced apparently by those violent eruptions, no gems of this kind ever have been discovered.

What has been said hitherto is the result of ocular observations or authority, and I should be happy to continue speaking in the same strain throughout the whole; but all those subjects which have not been touched on as yet, I was prevented subjecting to that kind of inquiry which alone cannot be depended upon.

First of all, I came several days too soon for the last operation, that of separating the diamonds from the earth, and considered it rather uncertain and unadvisable to wait at that place, in order to observe their mode of proceeding in that particular business. I made, therefore, all possible inquiries concerning it, the result of which I beg leave to relate in as few words as possible. The washing place, as already observed, is on the highest place of the mine, where light may be had from all sides. To this they bring the earth, and put it into a kind of square vat, knocked up in haste with some stones put upon each other. This place itself is scarcely ten feet square, and three feet deep, and is the most elevated part of the whole. They put some water upon the earth, and reduce the larger pieces by breaking them with stones. From thence the mass is carried to a lower square place, where it is spread somewhat thin. The labourers are then ordered to proceed in one line, and in a direction to have the sunshine on their faces, two feet asunder from each other; there they turn every stone, hold it up to their eyes, when it has a whitish clear colour, and even pretend that with their feet they are able to distinguish the diamonds from other stones, and this particularly by their rounded form.

The diamonds are to be delivered immediately by the finder to the attending person, who has to send them to the Tannadar, who, in order to encourage the people to be attentive, seldom fails to give them small presents of a piece of cloth, worth a rupee, or a gold ring about their hands, of eight or ten pagodas value. The latter is the premium for bringing a clear stone, without spots, equal to the weight of a pagoda.

I am unable to say any thing satisfactory of the form, lustre, and value of the gems at Mallavilly. If the miners could be believed, they are found angular as well as rounded, but of how many sides and angles, whether of eight or twelve, I was unable to ascertain. It should appear, from their assertions, that the diamonds are not incrustated, as they are said to be found in other mines. Less information, and indeed none, could I collect of the rubies that occur now and then in the same mines. These being found in the same matrix with the diamonds, give no reason to think that they, with all obvious differences about them, must be near related to the diamonds, and their ingredients to be the same, with the difference only of various proportions. The analysis shows, that calcarious matter enters their composition, though in a small proportion.

In the Guntore circar I have understood there are mines of the same kind, which, being the nearest to my station, I should like very much to visit once; but the expenses which are incurred by an excursion of this kind, will not, I am afraid, admit of my doing it soon.

I almost despair of ever seeing those places on the peninsula, or the other side of the Ganges, together with the mines of other kinds, being too sensible of my limited knowledge to solicit the permission of doing it in a public capacity, and the narrowness of my circumstances do not allow me to undertake such a voyage at my own expense; but humbly I recommend to Government (who I know receive uninterested suggestions with favour,) to send occasionally a scientific gentleman to those places, Pegu, Siam, &c. as well as Acheen, Bencoolen, &c. or to direct one who resides in or near those places to inquire particularly into their products, which we know abound in gold, silver, tin, iron, &c. with a variety of semi-metals and gems. An undertaking of still more use and consequence would be to explore the islands in the Indian seas, and especially the Andamans and Southern Nicobar Islands, as the vicinity of those countries abounds in metals, which induce a conclusion that those islands are not destitute of such treasures.

B. HEYNE.

To Dr. W. Roxburgh, Calcutta.